

**What is claimed is:**

1. A method of depositing a MgO film on a large area comprising the operations of:

applying an increasing voltage to at least one magnesium target;

applying an electric current to the at least one magnesium target when the applied voltage stops increasing so that a power with a negative square wave, which does not cause mutual interfere, is applied to the magnesium targets; and forming a MgO film on a substrate using magnesium particles emitted from the magnesium target by the power applied.

2. The method of claim 1, wherein the distance between the at least one magnesium target and the substrate is between 4 cm and 7 cm.

3. The method of claim 1, wherein the voltage applied to the at least one magnesium target is between 250V and 300V when the voltage stops increasing.

4. The method of claim 1, wherein the current applied to the at least one magnesium target increases until the power applied to the at least one magnesium target is saturated.

5. The method of claim 4, wherein the saturated power has a frequency between 10 kHz and 100 kHz.

6. The method of claim 4, wherein the duty ratio of the saturated power is between 30% and 60%.

7. An apparatus to deposit a MgO film within a large area comprising:

a magnetron part comprising at least a magnesium target and a permanent magnet positioned on one side of the magnesium target;

a power control part to apply power to the at least one magnesium target using a voltage and an electric current with a negative square wave which does not interfere

mutually, the power control part separately providing control to each of the magnesium targets;

a flow control part to supply gases for the magnesium target;

a substrate control part to control a substrate on which magnesium oxides are deposited;

a vacuum control part to control a vacuum state in a chamber; and

a heater control part to maintain a temperature in the chamber.

8. The apparatus of claim 7, wherein the at least one magnesium target includes more than one magnesium target in the magnetron part arranged in parallel.

9. The apparatus of claim 7, wherein the power control part operates under conditions between 10 kHz and 150 kHz in frequency, between 10% and 90% in duty ratio, less than 500 V in output voltage, and between 1 A and 50 A in output current.

10. The apparatus of claim 7, wherein the gases supplied to the magnesium target include oxygen and argon.

11. The apparatus of claim 7, wherein the flow control part comprises an oxygen flow regulator, an argon flow regulator, cut-off valves to block off gas flow to the magnesium target, and a gas supply line to supply the magnesium target with the gases.

12. The apparatus of claim 7, wherein the substrate control part supports the substrate using a substrate-supporting member and adjusts movement speed of the substrate.

13. The apparatus of claim 7, wherein the vacuum control part comprises a vacuum pump, a vacuum gage and a pressure regulator.

14. The apparatus of claim 7, wherein the heater control part maintains temperature in the vacuum chamber between 100°C and 200°C and is distanced from the substrate by a spacing between 5 cm and 10 cm.

15. The apparatus of claim 7, wherein the heater control part comprises a separate power supply independent of the power control part.